

**Statistical Procedure for**  
**Interpreting Background Water Quality Data**  
**for Available Assimilative Capacity**

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**For discussion by Missouri Antidegradation Advisory Group**

Missouri Dept. of Natural Resources

Water Protection Program

The following presents a method for determining whether or not a pollutant parameter or **pollutant of concern** (POC) is significantly less than the water quality standard (i.e., that a significant available assimilative capacity exists for the POC). These determinations are typically made from small data sets, so the method below is tailored to that situation.

1. It may be assumed that data on most trace pollutants, such as ammonia, metals, pesticides and nutrients are not normally distributed and therefore will require log transformation as the first step in the process. If the parameter is dissolved oxygen, pH, water temperature, or any of the major ions such as sulfate or chloride, a normal distribution may be assumed and a log transformation of the data would not be necessary.
2. Log transform the data (i.e., substitute the natural log of the datum for its true value).
3. Calculate the sample mean and the 90% (80%, 95%?) confidence interval around the mean. This may be done with EXCEL software (Tools/Data Analysis/Descriptive Statistics).
4. Calculate the antilog of the upper and lower confidence limits. If this range falls below the water quality standard, the data is shown to be significantly lower than the standard with the chosen level of confidence. If the standard falls within or below the confidence interval, the data would not be considered significantly lower than the standard, and consequently, one must assume that no available assimilative capacity exists.

Example:

POC = Dissolved Aluminum ( $\mu\text{g/L}$ )

Sample Results = 20, 40, 30, 850

WQ Standard = 750

Log Transformed Data = 3, 3.69, 3.4, 6.75

Log Mean = 4.21    Log 90% Confidence Limit = 2.02

Log of 90% Confidence Interval =  $(4.21 - 2.02)$  to  $(4.21 + 2.02)$  = 2.19  $\mu\text{g/L}$  to 6.23  $\mu\text{g/L}$

90% Confidence Interval = 8.9  $\mu\text{g/L}$  to 507.75  $\mu\text{g/L}$

Since this interval is less than the 750  $\mu\text{g/L}$  standard, data set is judged to be significantly less than the standard. Therefore, a significant available assimilative capacity exists for aluminum. As a result, a Tier 2 antidegradation review is required for any additional discharge of aluminum resulting in more than minimal degradation.